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## CLADONIA IN THE DISTRICT OF COLUMBIA AND VICINITY

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(Plates 210–212)

THE genus *Cladonia*, of which the largest and most familiar examples are the various species of reindeer-moss, occupies much the same position among lichens as is held by such genera as *Salix* and *Rubus* among flowering plants. The species are numerous, often very variable, and sometimes distinguishable only by differences in chemical reaction, so that, although the commoner species are for the most part easily recognized, the acquisition of a thorough knowledge of the forms occurring even in a somewhat restricted region is the work of years. In consequence, the study of the genus affords an interesting and profitable occupation for the student of flowering plants who seeks an object for his walks afield during the months of winter and early spring. It is at such times, when banks and fields are bared by melting snow, that many *Cladonias* are most conspicuous and can be collected in the best condition for study.

The external morphology of *Cladonias* is simple. A typical representative, *Cladonia cristatella* (see. PL. 210, F. 14), the common scarlet-fruited species found on earth or decaying wood, consists of three chief parts. From the horizontal part, known as the *primary thallus*, and composed of *squamules*, arise vertical stalks (*podetia*) bearing fruiting bodies (*apothecia*). In the reindeer-mosses (PL. 210, F. 1–5) the primary thallus is evanescent and very seldom seen, the plants consisting of masses of much branched, intertangled *podetia*. In different species the *podetia* (which are very rarely absent) may

<sup>1</sup> The senior author died on 22 Jan. 1930. In the final preparation of this paper for publication, material assistance has been given by Dr. Alexander W. Evans.



be short or comparatively long, simple or greatly branched, cylindrical or clavate. When more or less clavately enlarged and hollowed out at apex they are described as *cup-forming* (see PL. 210, F. 11-12; PL. 212, F. 3-4). Their surface, except in the reindeer-mosses, is usually *corticate*, that is, provided with a subcrustaceous outer layer, which often becomes broken and dispersed, leaving *interspaces* which expose the more downy *medulla*. In several species the podetia, rarely also the squamules, are more or less completely *decorticate* and *sorediose* (or *sorediate*), that is, covered with masses (*soredia*) of fine whitish powder, which under the microscope are found to consist of intertangled algal cells and fungal hyphae (see PL. 210, F. 9-10). In other cases the podetia may be *granulose*, *squamulose*, or *squamose*, the first term referring to the presence of coarse soredia, the two latter to the presence of small or large squamules similar to those of the thallus. The podetia, when cup-forming, are frequently *proliferous* from the center or margins of the cups in one or more series, the successive tiers of proliferations being known as *ranks* (see PL. 212, F. 4, 7). In the reindeer-mosses the character of the *gonidia*, small wart-like bodies on the podetia, is often of importance in the separation of the species.

The fundamental work for the study of Cladonias is Wainio's "Monographia Cladoniarum universalis," published in three parts<sup>1</sup> from 1887 to 1897. An illustrated account of the morphology of the genus, with photographs of several species, is given in Fink's "Lichens of Minnesota."<sup>2</sup> A key to the New England species and principal varieties then recognized was given in 1909 by the late Prof. L. W. Riddle.<sup>3</sup>

The latest and most generally useful publication on North American Cladonias is Dr. Alexander W. Evans' "The Cladoniae of Connecticut."<sup>4</sup> In this paper the author, in addition to a discussion of the recent important literature, morphology, local distribution, and habitats of the genus, has given carefully prepared keys to the groups, species, and minor forms occurring in Connecticut, with synonymy and abundant annotations. The 45 species treated include nearly

<sup>1</sup> Act. Soc. Faun. Fl. Fenn. **4**: 1-509. 1887; **10**: 1-498. 1894; **14**: 1-268. 1897. The first two parts are systematic, the third general.—In his most recent works Wainio altered the spelling of his name to Vainio, and both forms occur in the list of species in this paper.

<sup>2</sup> Contr. U. S. Nat. Herb. **14**: 107. pl. 11-17. 1910.

<sup>3</sup> RHODORA **11**: 212-214. 1909.

<sup>4</sup> Trans. Conn. Acad. **30**: 357-510. June, 1930.



all those which are common in the temperate eastern United States, so that the paper is of value to workers outside the area specially covered.

The present list of Cladonias of the District of Columbia and immediate vicinity is based on the local material of this genus in the U. S. National Herbarium collected by E. Lehnert (ca. 1884), J. M. Holzinger (1892), T. A. Williams (1896–1900), William R. Maxon (1899–1903), Mary F. Miller (ca. 1904–13), and Bruce Fink (1907), and on the collections of S. F. Blake (1924–26, and a single specimen collected in 1930). The last have practically all been determined by C. A. Robbins, who has also been able, through the kindness of Dr. William R. Maxon, to examine critically a number of specimens by earlier collectors preserved in the National Herbarium. All the species and forms listed in this paper have been collected in the region by the junior author except *C. mitis* and *C. alpicola* var. *karelica*, and all, except these two species and two forms (*C. chlorophaea* f. *centralis* and *C. strepsilis* f. *subsessilis*), are represented in his herbarium. Material of the two forms mentioned was identified by the senior author and is presumably preserved in his herbarium.

The only list of Cladonias of the District of Columbia region hitherto published is that by Rev. E. Lehnert (1886), forming a part of F. H. Knowlton's supplement to L. F. Ward's "Guide to the flora of Washington and vicinity," and including<sup>1</sup> the names of 20 species and 11 additional varieties. Examination of the material in Lehnert's herbarium, now incorporated in the United States National Herbarium, shows that a number of his species were misidentified. His *C. macilenta* and *C. Floerkeana* are *C. cristatella* f. *vestita*; his *C. pulchella* is *C. vulcanica* f. *minor*; his *C. symphycarpa* and *C. cariosa* are misnamed, being mixtures of several species; his *C. gracilis* is *C. chlorophaea* and *C. verticillata*. His *C. decorticata*, *C. degenerans*, *C. santensis*, and *C. leporina*, not now represented by specimens, cannot be identified, but it seems likely that all were incorrectly named. Lehnert's specimens of *C. alpicola* var. *karelica*, originally labeled *C. symphycarpa* and later *C. cariosa*, are the only ones known from the region.

Two principal floral areas are recognized for flowering plants in the District of Columbia region.<sup>2</sup> The Piedmont Plateau, characterized

<sup>1</sup> Proc. Biol. Soc. Washington 3: 123–4. 1886.

<sup>2</sup> See W. L. McAtee, "A sketch of the natural history of the District of Columbia," Bull. Biol. Soc. Washington 1: 57–90. 1918.—The area covered in the present



by the presence of metamorphic and igneous rocks, with caps of Coastal Plain deposits on the hilltops and on divides between streams, is separated by the Fall Line from the Coastal Plain of unconsolidated clays, gravels, and sands. Of the 36 species of *Cladonia* here listed, 23 show no sign of restriction in local habitat. Three species—*Cladonia coccifera*, *C. Floerkeana*, and *C. floridana*—are known only from the Coastal Plain. All are rare, occurring together at a single locality near Bladensburg and not elsewhere, except *C. floridana*, which has been collected at Lanham, two or three miles further east. *Cladonia squamosa* is most abundant in Coastal Plain areas, occurring only sparingly elsewhere. Seven species—*C. Boryi*, *C. foliacea*, *C. mitis*, *C. pityrea*, *C. polycarpia*, *C. pyxidata*, and *C. vulcanica*—are known only from Piedmont areas, and *C. furcata* is scarce outside the Piedmont region. One species, *C. alpicola*, is represented only by a single unlocalized collection. The wide range of Cladonias in general is shown by the fact that, of the 36 species here listed, at least 19 are recorded from Finland by Vainio, while only 11 are not found in some part of Europe.

The identifications on which this paper rests have practically all been made by the senior author, who is also responsible for the key. The introduction and annotated list of species were also examined and corrected by him. The illustrations in this paper represent average specimens, not specimens selected to show extremes of development.

#### KEY TO GROUPS AND SPECIES

Subg. 1. *Cladina* (Nyl.) Wain. Primary thallus crustaceous, evanescent, seldom seen. Podetia slender, elongated, much branched, arachnoid-tomentose and without cortex but often with a pseudo-cortex formed of scattered or contiguous gonidia; apices minutely 2-8-forked; apothecia fuscous, small, often absent.—Plants intricately massed-entangled. The reindeer-mosses.

Plants ashy grayish, not at all yellowish, coarse; KOH + (distinctly yellow).<sup>1</sup> (Pl. 210, f. 1.) . . . . . 1. *C. rangiferina*.

paper on *Cladonia* is the same as that of the "Flora of the District of Columbia and Vicinity," by A. S. Hitchcock and P. C. Standley (Contr. U. S. Nat. Herb. 21. 1919)—a circle of approximately 15 miles radius with the Capitol as a center.

<sup>1</sup> Nearly all species of *Cladonia* give a color reaction when touched with a saturated solution of caustic potash. In many cases this is merely a brightening of the natural color of the plant. Several species, however, undergo a distinct and immediate color change. In some the reaction is best obtained by using KOH in combination with a saturated solution of chloride of lime. Usually the reaction is yellow. In *C. strepsilis* with CaCl (alone) it is immediately bluish-green, and in *C. subcariosa* and *C. polycarpia* (with KOH alone) it is slowly red or reddish brown. A plant's reaction, therefore, whether positive or negative, is often of diagnostic value. In the keys here given the reaction is not mentioned where it has no such value. Unless otherwise stated, the plus sign indicates that the reaction is yellow, the minus sign that there is no color reaction.



Plants yellowish-green, varying to white, green, or gray, usually more delicate; KOH—(or pale yellow in *C. tenuis*).

Gonidia dissolving.—Podetia irregularly branched or often subdichotomously divided throughout, here and there roughened with disintegrating gonidia; gonidia greenish, whitish, or yellowish, often darkening, the interspaces soon naked and often pellucid. (Pl. 210, f. 2.) . . . . . 5. *C. impexa*.

Gonidia persistent.

Podetia with the branches neither radiate nor whorled, subunilateral throughout; axils in part closed; apices soon nodding; KOH + (pale yellow). (Pl. 210, f. 3.) . . . . . 3. *C. tenuis*.

Podetia with the branches irregularly to subregularly radiate or whorled; axils gaping; KOH—.

Branches with abundant subsecund branchlets; apices nodding, minutely 3–8-pointed; gonidia grayish, greenish, or occasionally brownish, the interspaces tomentose. (Pl. 210, f. 4.) . . . . . 2. *C. sylvatica*.

Branches with usually few dichotomously divided branchlets, the branchlets slender, tapering, divaricate, straight; apices minutely forked or 3–5-pointed; gonidia whitish to yellowish, the interspaces smooth. (Pl. 210, f. 5.) . . . . . 4. *C. mitis*.

Subg. 2. *Pycnothelia* Ach. Primary thallus granular-crustaceous, persistent. Podetia short, stout, simple or short-branched, corticate, suggesting minute cacti; terminations obtuse; apothecia small, fuscous.—Plants not intertangled. (Pl. 210, f. 6.) . . . . . 6. *C. papillaria*.

Subg. 3. *Cenomyce* (Ach.) Th. Fr. Primary thallus foliaceous, persistent or disappearing.

Series A. *Cocciferae* Del. Apothecia scarlet (whitish in rare color-forms).

a. *Subglaucescetes* Wain. Primary squamules grayish-green above, white beneath; podetia whitish to grayish-green. (In the region here dealt with, represented only by plants having the podetia often sterile, with obtuse to subulate apices, mainly or wholly decorticate, the decorticate areas farinose-sorediate or granulose.)

Decorticate areas pellucid and granulose or granulose-squamulose, usually darkening, KOH+. (Pl. 210, f. 7.) . . . . . 7. *C. vulcanica*.

Decorticate areas impellucid and farinose-sorediate, usually whitish.

Podetia usually basally corticate, above with the cortex dispersed or more or less continuous particularly below the apices; KOH—. (Pl. 210, f. 8.) . . . . . 8. *C. Floerkeana*.

Podetia occasionally basally corticate, above wholly decorticate and farinose-sorediate.

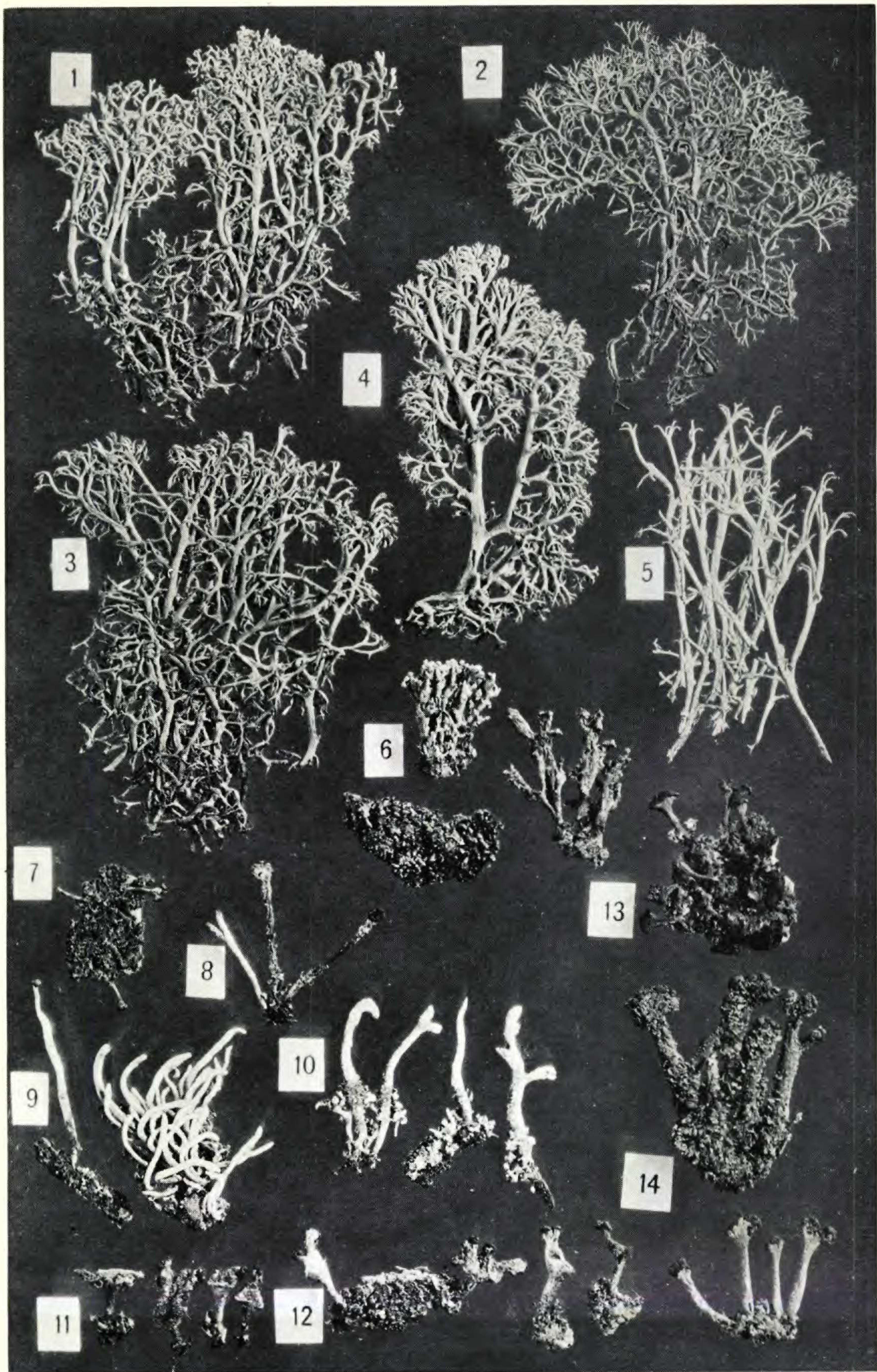
KOH—. (Pl. 210, f. 9.) . . . . . 9. *C. bacillaris*.

KOH+. (Pl. 210, f. 10.) . . . . . 10. *C. macilenta*.



- b. *Stramineo-flavidae* Wain. Primary squamules yellowish-green above, white or yellowish beneath; podetia yellowish-green.
- Podetia cup-forming, sterile or fertile (CaCl) KOH +.
- Cortex persistent, not at all sorediate. (Pl. 210, f. 11.).....11. *C. coccifera*.
- Cortex disintegrating, more or less sorediate. (Pl. 210, f. 12.).....12. *C. pleurota*.
- Podetia not cup-forming, always terminated by apothecia; cortex continuous to areolately dispersed or wanting; (CaCl) KOH -.
- Plants not at all sorediate; podetia typically short-branched above; decorticate areas persistently arachnoid, whitish. (Pl. 210, f. 14.).....13. *C. cristatella*.
- Plants more or less sorediate; podetia typically club-shaped: decorticate areas naked, subpellucid, soon darkening. (Pl. 210, f. 13.).....14. *C. paludicola*.
- Series B. *Ochrophaeae* Wain. Apothecia brown to pale flesh-color.
- a. *Unciales* (Del.) Wain. Primary thallus evanescent, rarely seen. Podetia not persistent basally, cylindrical to irregularly turgescens, corticate, never squamulose, becoming much branched and intertangled; cortex usually smooth and shining; *apices spinose*.—In the massed habit of growth the group resembles the Cladinas. It can readily be distinguished from them by its conspicuous cortex, and (as well as from all other species here listed) by its spinose-tipped podetia.
- Podetia corticate, the surface usually smooth. (Pl. 211, f. 1.).....15. *C. uncialis*.
- Podetia more or less decorticate, the surface roughened by depressions or perforations.....16. *C. Boryi*.
- b. *Chasmariae* (Ach.) Floerke. Primary thallus persistent or disappearing, the squamules white beneath. Podetia usually persistent basally, *cupless or with open cups* (i. e., not closed by a diaphragm); axils usually open.
- Primary squamules large; segments elongated, the margins entire or sinuate; podetia none; apothecia (usually wanting) sessile on the primary squamules; KOH +. (Pl. 211, f. 7.)  
22. *C. apodocarpa*.
- Primary squamules small to medium, the margins segmented; segments crenate to finely incised.
- Podetia essentially none; apothecia (usually present) sessile or short-stalked on the primary squamules; KOH - . (Pl. 211, f. 6.).....21. *C. caespiticia*.
- Podetia conspicuously developed.
- Podetia cup-forming, the cups well developed and conspicuous to very small; cortex disintegrating, but in local forms neither sorediate nor granulose; KOH - . (Pl. 211, f. 5.)  
20. *C. squamosa*.





Figs. 1-5, *CLADONIA*, subg. *CLADINA*; fig. 6, subg. *PYCNOTHELIA*; figs. 7-14, subg. *CENOMYCE*, series *COCCIFERAE*.



Podetia not cup-forming.

Plants sorediate, granulose or granu-  
lose-squamulose, usually very  
small and delicate, growing  
on decaying wood; podetia  
short, often simple; cortex  
dispersed to wholly wanting;  
KOH+. (Pl. 211, f. 3.) 18. *C. delicata*.

Plants neither sorediate nor granulose,  
growing normally on earth.

Podetia short-branched; cortex  
areolate; apices obtuse;  
axils round-perforate;  
KOH+. (Pl. 211, f. 2.)

17. *C. floridana*.

Podetia much branched, the  
branches slender, elon-  
gated; cortex continuous  
to areolate; apices often  
subulate; axils irregularly  
gaping; KOH-. (Pl. 211,  
f. 4.) . . . . . 19. *C. furcata*.

c. *Clausae* Wain. Primary thallus persistent or disap-  
pearing, the squamules white or creamy beneath.  
Podetia usually persistent basally, *cupless or with  
closed cups* (i. e., closed by a diaphragm); axils  
closed. Plants not intertangled.

Primary squamules grayish-green to olivaceous above,  
beneath white, not yellowish anywhere.

Podetia cup-forming.

Plants neither sorediate nor granulose.

Cups irregular, shallow, usually partly  
or wholly obliterated by ir-  
regular marginal or occasion-  
ally central proliferations.

(Pl. 212, f. 8.) . . . . . 32. *C. mateocyatha*.

Cups regular.

Cups deep (goblet-form); prolif-  
erations normally mar-  
ginal; cortex smooth to  
warty-areolate (Pl. 212, f.  
3.) . . . . . 28. *C. pyxidata*.

Cups very shallow (saucer-form);  
proliferations normally  
central, usually several-  
ranked; cortex smooth.

(Pl. 212, f. 7.) . . . 33. *C. verticillata*.

Plants sorediate or granulose.

Soredia farinaceous; squamules coarse,  
with margins somewhat lo-  
bate; cups narrow, often  
abortive or obsolete. (Pl. 212,  
f. 5.) . . . . . 30. *C. coniocraea*.

Soredia granulose.

Cups deep and large. (Pl. 212, f.  
4.) . . . . . 29. *C. chlorophaea*.

Cups shallow, irregular or abor-  
tive, small. (Pl. 212, f.  
6.) . . . . . 31. *C. pityrea*.



Podetia not cup-forming.

Plants sorediate or granulose.

Soredia farinaceous; primary squamules usually large, with margins sublobate; apices subulate. (Pl. 212, f. 5.) 30. *C. coniocraea*.

Soredia granulose; primary squamules small; apices acute to sub-obtuse. (Pl. 212, f. 6.) 31. *C. pityrea*.

Plants neither sorediate nor granulose.

Primary squamules small to minute; podetia slender, simple, often short, usually somewhat tortuous, always terminated by comparatively large apothecia; cortex dispersed, often wholly wanting; KOH—. (Pl. 211, f. 8.) . . . . . 23. *C. mitrula*.

Primary squamules medium to large; podetia regularly to irregularly club-shaped, often stout, simple or with short, obtuse branches, sterile or fertile.

Podetia greenish, laterally much fissured and torn (cancellate-cariose); cortex becoming dispersed in small subpeltate areoles; KOH—. (Pl. 212, f. 2.) . . . . . 27. *C. alpicola*.

Podetia grayish-green to olivaceous, laterally subentire or here and there depressed or flattened; cortex continuous to areolate.

Plants CaCl+(bluish-green). (Pl. 212, f. 10.) . . . . . 35. *C. strepsilis*.<sup>1</sup>

Plants CaCl—  
KOH—. (Pl. 212, f. 1.) . . . . . 26. *C. clavulifera*.

KOH+(yellowish, soon brick-red). (Pl. 211, f. 9.) . . . . . 24. *C. subcariosa*.

KOH+(persistently yellow mixed with red). (Pl. 211, f. 10.) 25. *C. polycarpia*.

Primary squamules distinctly yellowish.

CaCl(KOH)+(bluish green). (Pl. 212, f. 10.) . . . . . 35. *C. strepsilis*.

CaCl(KOH)+(yellow).

Squamules large, yellowish above, cream-colored or whitish beneath, with rounded segments, the margins

<sup>1</sup> No other *Cladonia* species yields this color reaction to chloride of lime (particularly when followed by KOH). The under surface of the squamules shows it most conspicuously.



- entire or subentire; podetia and apothecia rarely developed. (Pl. 212, f. 9.) . . . . . 34. *C. foliacea*.<sup>1</sup>
- Squamules small to medium, yellowish above, white beneath, with incised margins; podetia slender, simple or fastigiately much branched, the branches short; cortex cracked and dispersed in flat or recurved, partly detached patches; apothecia minute to large, often abundant. (Pl. 212, f. 11.) . . 36. *C. piedmontensis*.

1. *C. RANGIFERINA* (L.) Web.—PL. 210, F. 1.—In moss among rocks in woods, scarce (near Prospect Hill, Fairfax Co., Va.; on clayey bank, edge of mixed woods, near Lanham, Md.; and on slope in pine woods, Burnt Mills, Md., *Blake*). In addition to the typical form, the f. *CRISPATA* Coem., a small form with densely crowded, intertangled branches, has been collected.

2. *C. SYLVATICA* (L.) Hoffm.—PL. 210, F. 4.—Clayey ground, on edge of woods, scarce (near Landover, near Lanham, Burnt Mills, and Suitland bog, Md., and near Mt. Vernon, Va., *Blake*). Among the specimens collected are some referable to f. *PYGMAEA* Sandst., a dwarf form, and others to f. *SPHAGNOIDES* (Floerke) Oliv., with the podetia well branched from near base to apex, and the upper branchlets and apices erect or suberect.

3. *C. TENUIS* (Floerke) Harm.—PL. 210, F. 3.—In similar habitats to *C. impexa*, sometimes growing with that species, but less common (*Miller, Blake*).

4. *C. MITIS* Sandst.—PL. 210, F. 5.—Dry roadside bank near Great Falls, Va. (*Miller*).

5. *C. IMPEXA* Harm.—PL. 210, F. 2.—In poor soil in pine or deciduous woods, sometimes on banks or rocks, abundant (*Lehnert, Fink, Miller, Blake*). The following forms have been found typically developed: f. *CONDENSATA* (Floerke) Sandst. (*Cenomyce sylvatica* var. *condensata* Floerke), a dense low form; and f. *LAXIUSCULA* (Del.) Sandst. (*C. sylvatica* var. *laxiuscula* Del., in part), with nodding apices. This appears to be the commonest species of the reindeer-moss group in our region, and is rarely found except in a sterile condition. The earlier collections were referred to *C. rangiferina* or *C. sylvatica*, both of which, as now interpreted, seem to be scarce here.

6. *C. PAPPILLARIA* (Ehrh.) Hoffm.—PL. 210, F. 6.—Fields and hillsides, in sandy or clayey soil, fairly common (*Lehnert, Miller, Blake*). Represented by three forms: f. *MOLARIFORMIS* (Hoffm.) Schaer., with podetia well developed, often much branched; f. *PAPPILLOSA* Fr., with podetia papilliform; and f. *STIPATA* Floerke, with podetia sterile and very densely papillose-branched above.

<sup>1</sup> The usually large spreading colonies of coarse yellowish squamules are conspicuous and characteristic. The chemical response to KOH combined with CaCl is also diagnostic.



7. *C. VULCANICA* Zolling. f. **minor** Robbins, n. forma.—PL. 210, F. 7.—Podetia only 2.5–8 mm. high; otherwise as in *C. vulcanica*.—"District of Columbia" (*Lehnert*); on old log in woods, Lyonhurst, Arlington Co., Va. (*Miller*); on old log in woods, Prospect Hill, Fairfax Co., Va., 17 Feb. 1925 (*Blake*; type collection); on logs, Riggs Mill and vicinity, near College Park, Md. (*Blake*).

*Cladonia vulcanica* Zolling. differs from *C. didyma* (Fée) Wainio in its yellow reaction with caustic potash, as does *C. macilenta* from *C. bacillaris*, and should likewise be given specific rank. It has apparently not hitherto been recorded north of Mexico. The f. *minor* differs only in its diminutive podetia; those of the typical plant are described by Wainio as 8–45 mm. long.

8. *C. FLOERKEANA* (Fr.) Floerke.—PL. 210, F. 8.—Sandy loam in clearing, at one locality in vicinity of Landover, near Bladensburg, Md. (*Blake*). The specimens collected belong to var. *INTERMEDIA* Hepp, with sorediose, esquamose podetia.

9. *C. BACILLARIS* (Ach.) Nyl.—PL. 210, F. 9.—On logs, stumps, and bases of trees, rarely on ground, common (*Fink, Miller, Blake*). Most of our material belongs to f. *CLAVATA* (Ach.) Wain.

10. *C. MACILENTA* Hoffm.—PL. 210, F. 10.—On decaying logs in woods, on rocks, or in clearings, apparently rare (*Fink, Blake*). All material collected belongs to f. *STYRACELLA* (Ach.) Wain.

11. *C. COCCIFERA* (L.) Willd.—PL. 210, F. 11.—Sandy loam in clearing, at one locality in vicinity of Landover, near Bladensburg, Md. (*Blake*). Specimens collected represent var. *STEMMATINA* (Ach.) Wain., without squamae on podetia or cups, and var. *PHYLLOCOMA* Floerke, with the podetia and particularly the margins of the cups squamose.

12. *C. PLEUROTA* (Floerke) Schaer.—PL. 210, F. 12.—In woods, in clearings, and on banks, sometimes on exposed rocks, not common (*Lehnert, Miller, Blake*). In addition to the common form, with naked podetia of medium length, the following forms occur: f. *DECORATA* (Wain.) Evans, with short esquamose podetia 4–10 mm. long, and apothecia sessile on margins of cups; var. *FRONDESCENS* (Nyl.) Oliv., with squamose podetia; and var. *CERINA* (Nagel) Th. Fr., with whitish apothecia (rare; Plummer Island, Md.).

13. *C. CRISTATELLA* Tuck.—PL. 210, F. 14.—On ground in fields and woods and on banks, occasionally on logs or the bases of trees; an abundant and beautiful plant (*Lehnert, Holzinger, Maxon, Williams, Fink, Miller, Blake*). Represented by the following forms: f. *BEAUVOISII* (Del.) Wain., with naked podetia and scarlet apothecia (common); f. *OCHROCARPIA* Tuck., similar but with pale flesh-colored or whitish apothecia (rare); f. *VESTITA* Tuck., like f. *BEAUVOISII* but with podetia squamulose (abundant); and f. *SQUAMULOSA* Robbins, like f. *vestita* but with whitish or flesh-colored apothecia (rare; non-



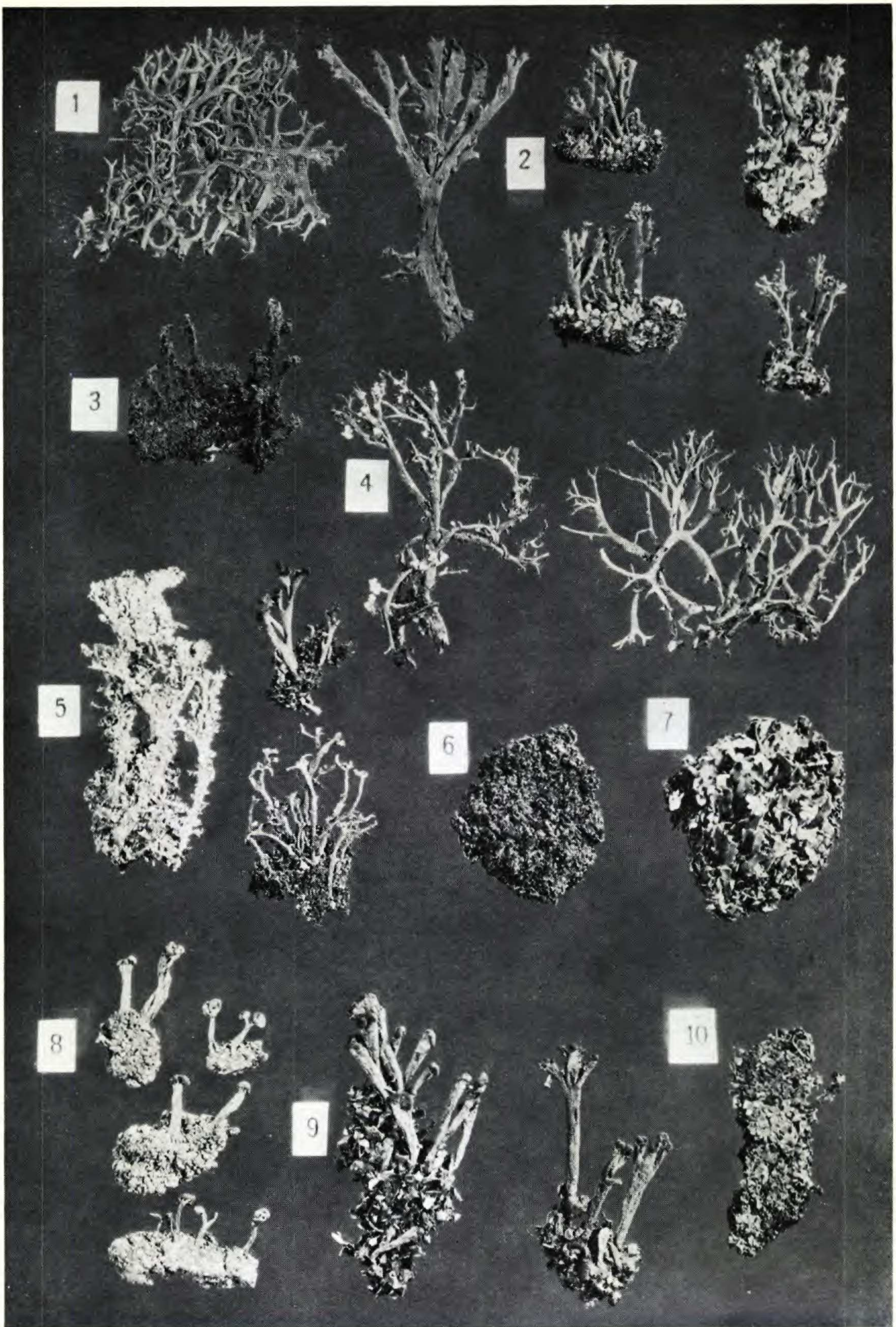


Fig. 1, *CLADONIA*, subg. *CENOMYCE*, ser. *OCHROPHAEAE*, subser. *UNCIALES*; figs. 2-7, subser. *CHASMARIAE*; figs. 8-10, subser. *CLAUSAE*.



typical plants from Great Falls, Va., and an intermediate plant toward f. *vestita*, bearing a few small scarlet apothecia mixed with abundant whitish ones, near Mt. Vernon, Va.).

14. *C. PALUDICOLA* (Tuck.) Merrill, Bryologist **27**: 23. 1924.—PL. 210, F. 13.—On old log in woods, near Lyonhurst, Arlington Co., Va. (*Miller*); on decaying stump in pine woods, vicinity of Landover, near Bladensburg, Md. (*Blake*).

15. *C. UNCIALIS* (L.) Web.—PL. 211, F. 1.—Sandy or clayey ground in woods or on banks, sometimes on rocks, fairly common (*Lehnert, Miller, Blake*). The following forms have been collected: f. *DICRAEA* (Ach.) Wain., with dichotomously branched podetia with subulate apices, the axils more or less pervious; f. *OBTUSATA* (Ach.) Nyl., with polytomously branched podetia with obtuse apices, the axils scarcely dilated and destitute of rhizinae; f. *SUBOBTUSATA* Arn., similar to f. *obtusata* but with dilated axils provided with rhizinae.

16. *C. BORYI* Tuck. (*C. reticulata* (Russell) Wain.) In path, Upton Hill, Arlington Co., Va. (*Blake & Diehl*). The specimens belong to f. *PROLIFERA* Robbins, with podetia bearing short irregular adventitious branches. The species is so closely similar in appearance to *C. uncialis* that it has not seemed necessary to present a figure of it.

17. *C. FLORIDANA* Wain.; Robbins, RHODORA **29**: 136. pl. 157. 1927. (*C. Beaumontii* Wain. Act. Soc. Faun. Fl. Fenn. **10** (Monog. Clad. **2**): 455. 1894, as to descr., not as to name-bringing syn.)—PL. 211, F. 2.—Common at one locality in vicinity of Landover, near Bladensburg, Md., in sandy loam in clearing; collected also on a clayey bank near Lanham, Md. (*Blake*). The following nominal formae have been collected: f. *TYPICA* Robbins, fertile plants with squamulose podetia; f. *ESQUAMOSA* Robbins, fertile plants with squamulose podetia; f. *ELEGANS* Robbins, sterile plants with squamulose podetia; f. *BRACHIATA* Robbins, sterile plants with squamulose podetia.

18. *C. DELICATA* (Ehrh.) Floerke.—PL. 211, F. 3.—On decaying logs and stumps in woods, fairly common (*Williams, Miller, Blake*). Our plants are f. *QUERCINA* (Pers.) Wain., which is the normal form everywhere.

19. *C. FURCATA* (Huds.) Schrad.—PL. 211, F. 4.—On rocks or on ground in woods, often growing in moss; scarcer below the fall line (*Lehnert, Fink, Maxon, Miller, Blake*). The following varieties and forms occur: var. *RACEMOSA* (Hoffm.) Floerke, with squamose podetia; var. *RACEMOSA* f. *SUBCLAUSA* (Sandst.) Evans, with essentially naked podetia having the sterile summits slightly expanded, subtruncate, with 2–5 spreading points, forming small pseudo-cups; and var. *PINNATA* (Floerke) Wain. f. *FOLIOLOSA* (Del.) Wain., with squamulose, subulate-tipped podetia. With the exception of specimens representing f. *subclausa*, the material of var. *racemosa* is intermediate between f. *corymbosa* (Ach.) Nyl. and f. *furcato-subulata* (Hoffm.) Wain.



20. *C. SQUAMOSA* (Scop.) Hoffm.—PL. 211, F. 5.—Usually in sandy ground in pine woods or clearings, rarely on decaying logs or on rocks; common on the high ground between Bladensburg and Lanham, Md., not common elsewhere (*Miller, Blake*). A very variable species, the following forms being represented among local specimens: f. *DENTICOLLIS* (Hoffm.) Floerke, with podetia cup-forming, decorticate, the upper half without squamules; f. *SQUAMOSISSIMA* Floerke, similar but densely squamulose throughout with fine squamules; f. *PHYLLOCOMA* (Rabenh.) Wain., similar to the last but corticate and coarsely squamulose;<sup>1</sup> f. ***sessilis*** Robbins, n. f., with apothecia borne on the primary squamules, the podetia more or less abortive, bearing apothecia laterally as well as terminally (TYPE from clayey bank on edge of woods near Lanham, Md., 6 Dec. 1925, *Blake*); f. *LEVICORTICATA* (Sandst.) Evans, with the podetia cup-forming, corticate, grayish, green often darkening, with or without squamules, represented by two modifications—m. *RIGIDA* (Del.) Evans, frequently squamulose and with short, rigid, often radiate, terminal proliferations, and m. *PSEUDOCRISPATA* Sandst., with well developed cups and smooth, short, often stout, whitish, esquamulose podetia; and f. *TURFACEA* Rehm, similar to f. *levicorticata*, but a dark, smooth-cortexed form of sunny situations.

21. *C. CAESPITICIA* (Pers.) Floerke.—PL. 211, F. 6.—Sandy ground, on banks and in woods (usually deciduous), rarely on logs, fairly common (*Fink, Miller, Blake*).

22. *C. APODOCARPA* Robbins, RHODORA 27: 211. 1925.—PL. 211, F. 7.—Usually in sandy loam in deciduous woods, sometimes in clay or among rocks, rather common (*Blake*). Rarely found in this locality in fruit. The sterile thallus of erect brittle squamae, ashy-glaucous above and chalky white beneath, is readily recognized.

23. *C. MITRULA* Tuck.—PL. 211, F. 8.—On ground in fields and woods and on banks, rarely on stumps, very common (*Lehnert, Williams, Maxon, Fink, Miller, Blake*). All local specimens belong to f. *IMBRICATULA* (Nyl.) Wain.

24. *C. SUBCARIOSA* Nyl.—PL. 211, F. 9.—In old fields and woods, in sandy or clayey soil, sometimes among rocks, very common (*Lehnert, Williams, Miller, Blake*). The forms occurring are: f. *EVOLUTA* Wain., with naked podetia; f. *SQUAMULOSA* Robbins, with squamulose podetia; f. *EPIPHYLLA* Robbins, with apothecia sessile on primary thallus; f. ***pallida*** Robbins, n. forma, with apothecia flesh-colored or whitish, and naked podetia (TYPE collected on sandy slope in pine woods, vicinity of Landover, near Bladensburg, Md., 15 Feb. 1925, *Blake*).

25. *C. POLYCARPIA* Merrill, Bryologist 12: 46. pl. 4, f. 4. 1909.—PL. 211, F. 10.—A single scanty collection from log in open woods, Great Falls, Va. (*Blake*).

<sup>1</sup> The three forms first mentioned are closely related, and by some authors the two last are treated as modifications of the first.



26. *C. CLAVULIFERA* Wain. in Robbins, *RHODORA* 26: 145. 1924.—PL. 212, F. 1.—On ground in clearings or woods (usually deciduous), rarely on logs or among rocks, rather scarce (Washington, D.C.; vicinity of Landover, near Bladensburg, Md.: near Riggs Mill, Md.; Plummer Island, Md.; and Great Falls, Va., *Blake*). In addition to the typical form with naked podetia, f. *SUBVESTITA* Robbins, with squamulose podetia, has been collected.

27. *C. ALPICOLA* (Flot.) Wain. var. *KARELICA* Wain.—PL. 212, F. 2.—Known from our region only by two fruiting specimens collected by *Lehnert* in "District of Columbia," and mounted with others of *C. mitrula* and *C. subcariosa*. The plant grows on the ground in old fields.

28. *C. PYXIDATA* (L.) Fr.—PL. 212, F. 3.—On ground in woods and on rocks, scarce (*Fink, Blake*). Our plants belong to var. *NEGLECTA* (Floerke) Mass., represented by two forms; f. *SIMPLEX* (Ach.) Harm., with esquamose podetia, and f. *LOPHYRA* (Ach.) Rabenh., with squamose podetia.

29. *C. CHLOROPHAEA* (Floerke) Spreng.—PL. 212, F. 4.—On ground, often in moss, in deciduous or evergreen woods, and on banks and rocks, rarely on bases of trees; abundant (*Lehnert, Maxon, Fink, Miller, Blake*). The commonest and most variable *Cladonia* about Washington. The following named forms have been collected: f. ***carneopallida*** (Ach.) Robbins, n. comb.,<sup>1</sup> with pale flesh-colored apothecia (rare; collected once in its typical form, and once in a squamose state); f. *SIMPLEX* (Hoffm.) Arn., 1-ranked esquamulose sterile plants with decorticate surface of cups smooth and opaque; f. *COSTATA* (Floerke) Arn., similar but with decorticate surface of cups pellucid and more or less striate; f. *PROLIFERA* (Wallr.) Arn., like f. *simplex* but with the cups marginally proliferous, the secondary ranks mostly cup-forming; f. *CENTRALIS* (Flot.) Vain., like f. *costata* but with central proliferations; f. *PTERYGOTA* (Floerke) Vain., sterile squamulose plants; f. *CARPOPHORA* (Floerke) Anders, fertile esquamulose plants with distinct cups bearing sessile or short-stipitate podetia; f. *HOMODACTYLA* (Wallr.) Robbins, similar to the last but with indistinct cups and apothecia borne on long stipes; f. *LEPIDOPHORA* (Floerke) Sandst., with podetia fertile and squamulose.

30. *C. CONIOCRAEA* (Floerke) Sandst.—PL. 212, F. 5.—On ground, on bark, and on rocks, fairly common (*Lehnert, Miller, Blake*). Three forms occur: f. *CERATODES* (Floerke) Vain., with esquamulose, subulate-tipped podetia; f. *TRUNCATA* (Floerke) Vain., with esquamulose, truncate or obscurely cup-bearing podetia; and f. *PHYLLOSTROTA* (Floerke) Vain., with squamose podetia.

31. *C. PITYREA* (Floerke) Fr.—PL. 212, F. 6.—On old log, Plummer Island, Md. (*Fink*); on ground in low woods, near Great Falls, Va.

<sup>1</sup>*Cenomyce fimbriata* γ. *C. carneopallida* Ach. Syn. Lich. 258. 1814, in part. *Cladonia pyxidata* var. *chlorophaea* f. *carneopallida* Harm. "Lich. Lorraine 142"; Lich. Fr. 305. 1907.